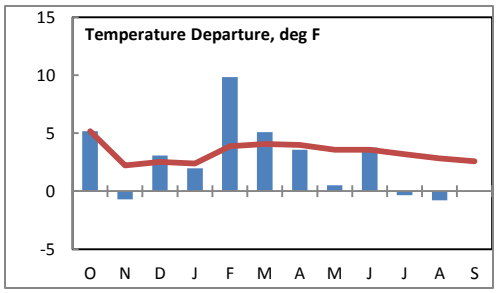
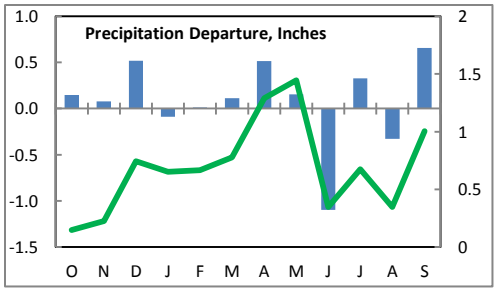
Montana Weather/Precipitation Summary

September 2016 NOAA's National Weather Service Great Falls Montana

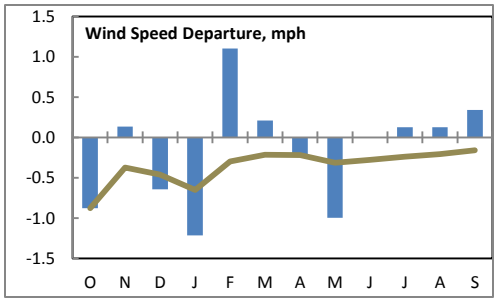
Upper level flow was generally westerly during September, but a trough along the west coast caused a dip in the flow over western Montana (Fig. 1). Temperatures were near to below slightly normal west and near to slightly above normal east. Precipitation was below normal west of the divide and above normal over the east. September's winds were above the long-term average.

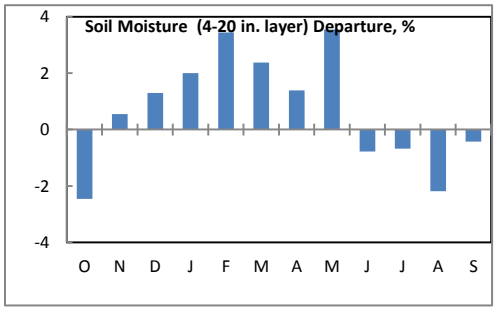
Statewide composite temperatures averaged normal for the month. The red line on the graph to the right shows the cumulative 12-month departure from normal. The temperature anomalies ranged from -2.9°F at Hot Springs to +4.6°F at Broadus (Fig. 2). The warmest average monthly temperature was 64.3°F at Broadus, and the coolest was 42.5°F at Flattop Mountain SNOTEL. This was the 62nd coolest September of record. For the past 12-months, the statewide composite average temperature is 2.6°F above normal. Eight of the last 12 months have had warmer than normal temperatures.





The monthly departure from normal for precipitation across Montana is shown in Figure 3. Below normal precipitation values were west of the divide, while above normal amounts prevailed east of the divide. The highest rainfall amount recorded was 6.10-inches at Poorman Creek (Cabinet Mtns). Elsewhere, 5.83" was reported near Broadus and 5.10" near Geraldine. Statewide, this month averaged 1.93", or 0.66" above normal. Grass Range had their second wettest September of record (4.15-inches). The statewide composite precipitation for the past 12 months is 1.00" above normal. The green line on the graph to the right shows the cumulative 12-month departure from normal. Nine of the past 12 months have measured above normal precipitation.
Some areas did collect some snow in September. Weather system brought 11" to Mystic Lake, while Wisdom picked up 0.5" for the month.





The statewide average winds were slightly stronger than normal in September, but ranked as the 39th calmest September of record. The statewide composite average was 8.6 mph, 0.3-mph above normal. The brown line of the graph to the right shows the 12-month cumulative statewide wind departure from normal. The 12-month average is running 0.2-mph below average. Seven of the past 12 months have had above normal average speeds. The fastest average speed was 16.9 mph at Deep Creek RAWS. At lower elevations, the strongest average was 13.4 mph at Harlowton. The strongest wind gusts were 65 mph at Deep Creek on the 17th, 64 mph at Babb on the 2nd, and 64 mph at Malmstrom AFB on the 21st.

Composite statewide soil moisture continued slightly below normal for September. The average of 15.8-percent is 0.4 points below the 22-year average of 16.2-percent. This is the 10th lowest September value since 1995.

Refer to NEIC's State of the Climate report for the latest monthly discussion:
http://www.ncdc.noaa.gov/sotc/

Sep 1-19
After a warm start on the first, temperatures cooled to below normal values for most of this period. Brandenburg topped out at 100F on the first. Thunderstorms accompanied a cold front on the 1st, producing wind gusts to 64 mph at Malmstrom AFB, 62 mph at Helena, and 60 mph south of Malta. Wind behind the front gusted to 64 mph at Babb on the second. As cooler temperatures settled over the state, precipitation fell on the 4th and 5th. Over one-inch of rain fell over portions of central and southeast Montana, with 1.74-inches reported at Baker and 1.73-inches at Grass Range. Ismay reported 2.28-inches during this storm. Very cool air, with temperatures averaging as much as 20 degrees below normal pushed into the state on the 12th. Up to 5 inches of snow fell at Badger Pass and 4-inches at Marias Pass. The larger amounts fell over southern Montana. Red Lodge and Cooke City picked up 12 inches of snow, with precipitation amounts as high as 1.80-inches at Billings by the 13th. Gates Park recorded the month's lowest temperature on the 13th, when they fell to 16°F. Temperatures warmed to above normal values from the 16th-19th. Heavy precipitation fell west of the divide from the 18th-19th. Fortine (Lincoln) measured 2.70-inches of rain, while 2.20-inches fell at Flattop Mountain. Winds picked up along the Rocky Mountain Front, with gusts to 65 mph at Deep Creek.

Sep 20-30
Temperatures returned to below normal values from the 20th-24th. Heavy precipitation fell over much of southern and southeast Montana. Lodge Grass (Big Horn) reported 3.56", while Ridge (Carter) reported 3.32". Further west, Zortman picked up 2.94" while Harkness (Beaverhead) measured 2.49". The last days of the month were warm again. Temperatures pushed into the 80s on some of the days, with dry conditions prevailing.

Precipitation/convection

Severe convective weather occurred on 1 day in September, which is normal for the month.

Water Year
The temperature was 45.8°F or 2.6°F above normal. This was the warmest water year since 2000 and the 9th warmest of record.
The composite precipitation was 16.15-inches, 1.02" inches above normal. This was the 41st wettest water year to date, and the wettest since 2014.
Winds averaged 8.8 mph, the 39th calmest of record, and 0.2 mph below normal.

September summary information:

High Temperature	100°F at Brandenberg (1st)	**Greatest Precip**	5.83" near Broadus
Low Temperature	16°F at Gates Park (13th)		6.10" at Poorman Crk SNOTEL
Warmest Ave Temp	64.3°F at Broadus	**Peak Wind Gust**	65 mph at Deep Creek RAWS (17th)
Coolest Ave Temp	42.5°F at Flathead Mtn SNOTEL		
Range of Temp departures	-2.9°F at Hot Springs to +4.6° at Broadus	**Highest Ave Wind**	13.4 mph at Harlowton 16.9 mph at Deep Creek RAWS
21 city mean monthly Temperature/Normal	56.1/56.1F normal. 62nd coolest of record (since 1880). 46th percentile. Oct-Sep 44.9/42.1 2.8F above normal. 9th warmest of record.	**20 city mean monthly wind speed/Normal**	8.6 mph/8.3 mph; 39th calmest of record (since 1936). 53rd percentile. Oct-Sep 8.8 mph/9.0 0.2-mph below normal. 21st calmest of record.
22 city mean monthly precipitation/Normal	1.93"/1.27" – 152% of normal. 23rd wettest of record (since 1880). 83rd percentile. Oct-Sep 16.15"/15.13" - 1.02" above normal. 41st wettest of record.		

Historical Rank of Precipitation (inches)
for the Current Month and Water Year to Date

Location	Sep	% of Norm	Rank	Pcntl	Oct 1 – Sep 30	% of norm	Rank	Pcntl	Years
Baker	4.29	375%			17.26	148%			18
Billings	1.58	118%	23	19	11.78	80%	67	59	112
Belgrade	1.10	100%	40	49	12.74	90%	50	63	79
Butte	1.32	132%	37	30	10.12	79%	88	72	122
Cut Bank	1.26	103%	33	29	11.82	109%	46	42	108
Dillon	1.48	176%	17	21	9.09	87%	43	56	76
Glasgow	1.67	178%	21	17	20.31	174%	3	2	116
Great Falls	2.22	156%	20	15	16.62	113%	37	29	124
Havre	1.80	161%	19	13	17.22	154%	14	10	136
Helena	0.97	88%	57	41	8.87	79%	109	79	137
Jordan	1.96	162%			14.68	116%			18
Kalispell	0.87	63%	61	49	17.14	101%	41	33	122
Lewistown	2.41	179%	17	13	18.29	109%	47	39	120
Livingston	1.64	136%	38	32	14.24	96%	56	51	109
Miles City	2.80	259%	10	6	14.72	118%	43	30	139
Missoula	1.13	98%	54	39	12.72	89%	77	59	130
Mullan Pass	1.76	110%	37	47	46.75	123%	15	19	74
Wolf Point	2.32	230%			15.60	128%			18
Glendive	3.77	297%	7	5	16.82	124%	23	20	113
Sidney	1.73	138%	57	74	13.77	96%	39	51	76
BZN-MSU	2.02	144%	41	29	17.34	88%	78	60	129

Rankings and Percentiles are 1=driest, higher numbers=wetter.
For an automated version of this chart, updated daily, go to
http://www.wrh.noaa.gov/tfx/dx.php?wfo=tfx&type=&loc=products&fx=PCPNTOTALS

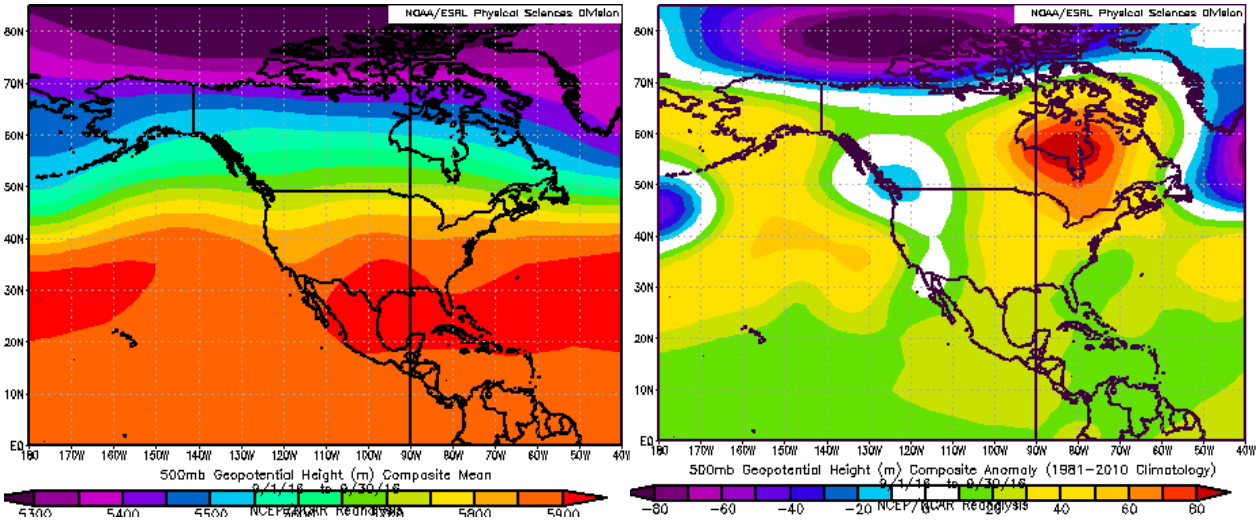


Figure 1. Mean flow at 500 millibars (~18,000 ft) for this month (left) and departure from normal (right).

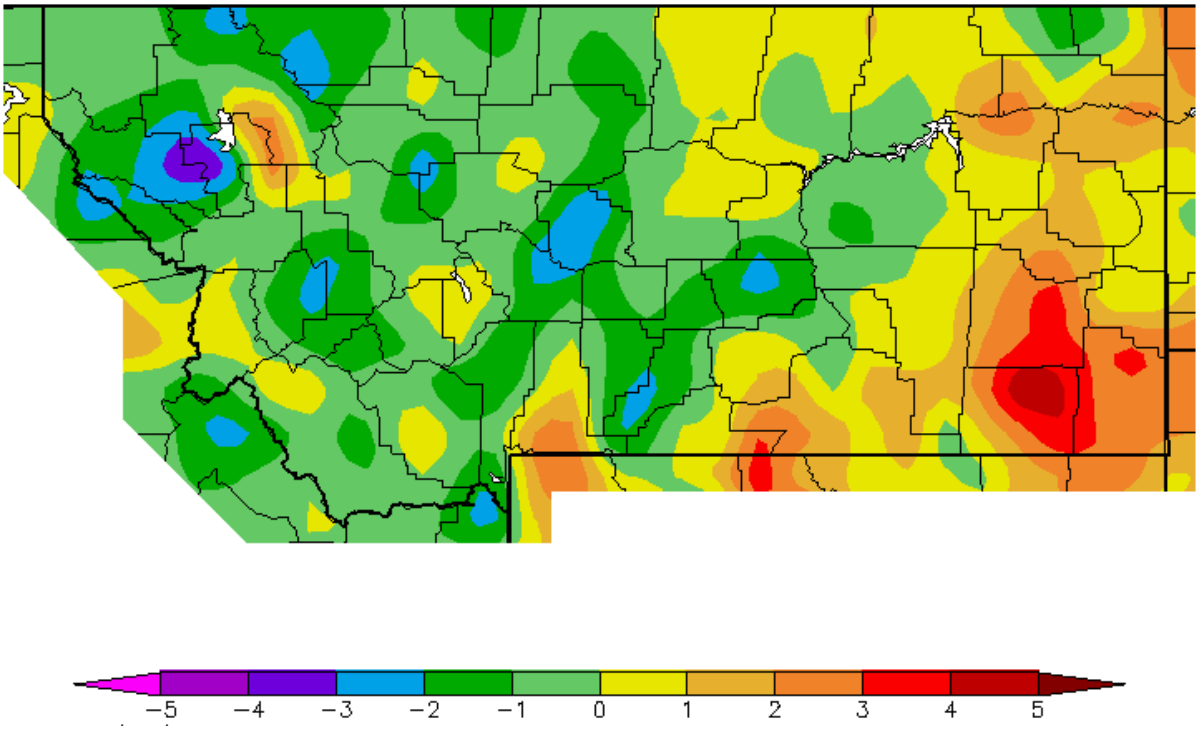


Figure 2. September 2016 temperature departures from normal (°F) (Western Region Climate Center).

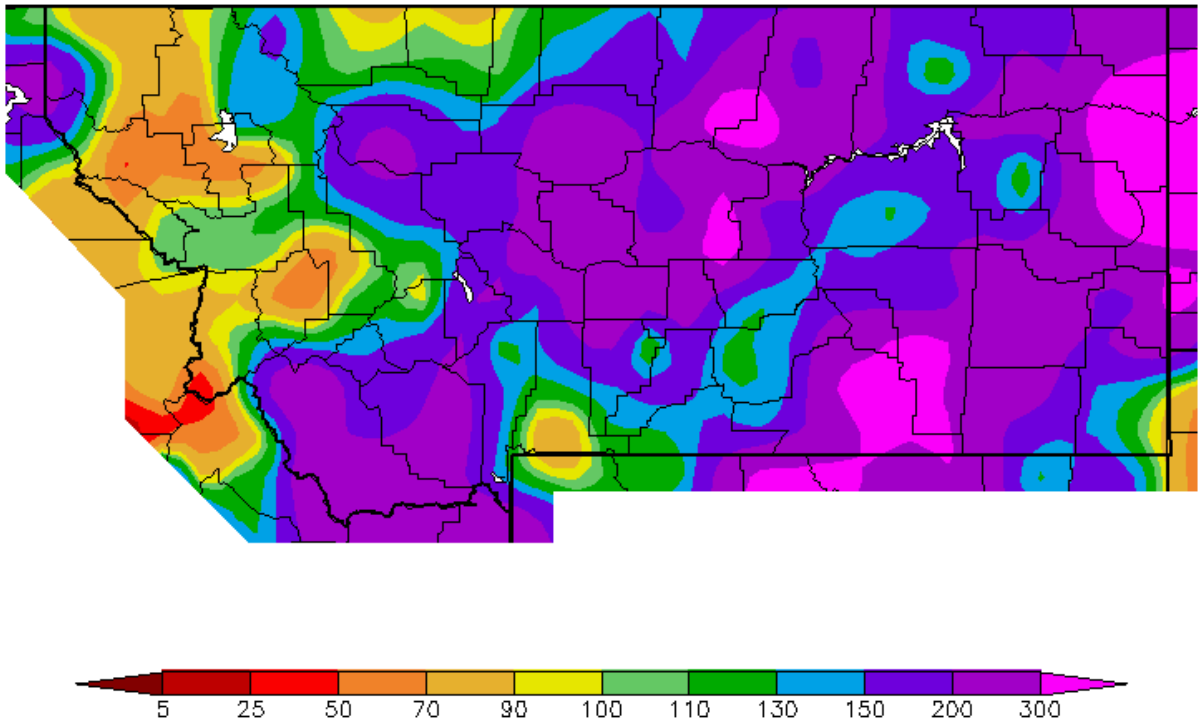


Figure 3. September 2016 precipitation departures from normal (percent) (Western Region Climate Center).

For a state map of % of normal water year precipitation (updated around the 7th of each month), go to: http://www.wrh.noaa.gov/tfx/climate/monthlysum/climatesum.php?wfo=tfx

For the latest information on mountain snowpack from the NRCS, go to: http://www3.wcc.nrcs.usda.gov/snow/index.html

For the latest U.S. Drought Monitor, issued weekly by the National Drought Mitigation Center, USDA and NOAA, go to: http://droughtmonitor.unl.edu/

These data are preliminary and have not undergone final QC by NEIC. Therefore, these data are subject to revision. Final and certified climate data can be access at the National Environmental Information Center (NEIC) http://www.ncdc.noaa.gov. Many more links are on the Drought Information Page of the NWS Great Falls web site at http://www.wrh.noaa.gov/tfx/main/drought.php?wfo=tfx. The climatological record for normals is 1981-2010. The ranking period for temperature, precipitation and snowfall is since 1880. The ranking period for wind speeds is since 1936. The ranking period for soil moisture is since 1995.